

Claims

1. A genetically modified monocotyledon plant cell, wherein the genetic modification consists of the introduction of at least one extraneous nucleic acid molecule and the extraneous nucleic acid molecule is selected from the group consisting of:
- 5 a) nucleic acid molecules which comprise the coding region of the nucleotide sequence represented in Seq ID No. 1;
- 10 b) nucleic acid molecules which encode an R1 protein from Solanum tuberosum with the amino acid sequence given in Seq ID No. 2;
- 15 c) nucleic acid molecules which constitute a derivative of the nucleotide sequence given in Seq ID No. 1; and
- 20 d) nucleic acid molecules which constitute fragments of the nucleic acid molecules cited in (a), (b) or (c).
- 25 2. A plant cell according to claim 1, which exhibits an increased biological activity of R1 protein compared with a corresponding non-genetically modified wild-type plant cell.
- 30 3. A plant cell according to one or more of claims 1 or 2, which synthesises a starch which has an increased phosphate content in the C6 position of the glucose monomer compared with starch from corresponding non-genetically modified wild-type plant cells.
- 35 4. A plant cell according to one or more of claims 1 to 3, which synthesises a starch which has an increased final viscosity and/or a reduced peak temperature compared with starch from corresponding non-genetically modified wild-type plant cells.
- 40 5. A plant cell according to one or more of claims 1 to 4, which synthesises a starch which after conglutination forms a gel which has an increased gel strength compared with a gel of starch from corresponding non-genetically modified wild-type plant cells.

6. A plant cell according to one or more of claims 1 to 5, which originates from a plant of the group consisting of wheat, rice, barley, oats, millet, rye and maize.

5 7. A plant cell according to one or more of claims 1 to 5, which originates from a wheat plant.

8. A plant cell according to claim 7, which synthesises a starch which in the C6 position of the glucose monomer has a phosphate content of at least 0.1 nmol C6 P
10 mg⁻¹ starch.

9. A method of producing a plant cell according to one or more of claims 1 to 8, wherein a cell of a monocotyledon plant is genetically modified, and wherein the genetic modification consists of the introduction of at least one extraneous nucleic acid molecule.
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10. A plant containing plant cells according to one or more of claims 1 to 8.

11. A plant according to claim 10, which in its starch-storing organs synthesises a starch which has an increased phosphate content in the C6 position of the glucose monomer compared with starch from the starch-storing organs of corresponding non-genetically modified wild-type-plants.
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12. A plant according to one or more of claims 10 to 11, which is a rice, wheat or maize plant.
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13. A method of producing a plant according to one or more of claims 10 to 12, wherein
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(a) a cell of a monocotyledon plant is genetically modified, wherein the genetic modification consists of the introduction of at least one extraneous nucleic acid molecule;
(b) a plant is regenerated from the cell according to step (a); and optionally
(c) further plants are produced from the plant produced according to step (b).

14. A method according to claim 13, wherein the extraneous nucleic acid molecule is under the control of a promoter which organ-specifically facilitates R1 gene expression in starch-storing tissues.

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15. A method according to one or more of claims 13 to 14, which relates to a wheat plant.

16. A propagation material for a plant according to one or more of claims 10 to 12
10 containing plant cells according to one or more of claims 1 to 8.

17. Use of nucleic acid molecules as defined in claim 1 for the production of monocotyledon plants according to one or more of claims 10 to 12 or of monocotyledon plant cells according to one or more of claims 1 to 8.

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18. A starch obtainable from a plant cell according to one or more of claims 1 to 8 or a plant according to one or more of claims 10 to 12.

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19. A starch according to claim 18, characterised in that it has an increased phosphate content in the C6 position of the glucose monomer and/or an increased final viscosity and/or a reduced peak temperature compared with starch from corresponding wild-type plants.

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20. A starch, characterised in that it has an increased phosphate content in the C6 position of the glucose monomer and/or an increased final viscosity and/or a reduced peak temperature compared with starch from corresponding wild-type plants.

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21. A starch, characterised in that in the C6 position of the glucose monomer it has a phosphate content of at least 0.1 nmol C6 P mg⁻¹ starch.

22. A starch according to claim 21, characterised in that it has a final viscosity which is increased by at least 50% and/or a peak temperature which is reduced by at least 1.5°C.

5 23. A starch according to one or more of claims 18 to 22, characterised in that after conglutination said starch forms gels which exhibit an increased gel strength compared with gels of corresponding chemically phosphorylated starches with the same phosphate content in the C6 position of the glucose monomer and/or compared with gels of starches from corresponding non-genetically modified plants.

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24. A starch according to one or more of claims 18 to 23, characterised in that the amylose component of said starch has a reduced total phosphate content in its amylose component compared with the amylose component of chemically phosphorylated starch.

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25. A starch according to one or more of claims 18 to 24, characterised in that it exhibits a modified phosphorylation pattern compared with chemically phosphorylated starch.

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26. A starch according to one or more of claims 18 to 25, characterised in that it is a wheat starch.

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27. A method of producing a starch according to one or more of claims 18 to 26 comprising the extraction of the starch from a plant according to one or more of claims 10 to 12.

28. Use of a starch according to one or more of claims 18 to 26 in the industrial field, preferably for the production of foodstuffs.

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29. Wheat flour, containing a starch according to one or more of claims 18 to 26.

30. Wheat flour obtainable from a plant cell according to one or more of claims 1 to 8 or from a plant according to one or more of claims 10 to 12 or from propagation material according to claim 16.
- 5 31. Use of the wheat flour according to claim 29 or 30 or of the starch according to one or more of claims 18 to 26 for the production of a baking mixture and/or for the production of a food product.
- 10 32. A baking mixture which contains the wheat flour according to claims 29 or 30 or the starch according to one or more of claims 18 to 26.
- 15 33. A food product which has been produced using the wheat flour according to claims 29 or 30 and/or using the baking mixture according to claim 32 and/or using the starch according to one or more of claims 18 to 26.